1η Εργασία

2ου εξαμήνου

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# 1 . Ecology

## Hierarchy

The scale of ecological dynamics can operate like a locked system, such as aphids migrating on a lone tree, while at the equal time remain open regarding extended scale influences, such as atmosphere or climate. Hence, ecologists classify ecosystems hierarchically by analyzing data collected from finer scale units, such as vegetation associations, climate, and soil types, and integrate this information to identify emergent patterns of uniform organization and processes that operate on local to regional, landscape, and chronological scales.

To structure the study of ecology into a conceptually manageable framework, the biological world is organized into a nested hierarchy, ranging in scale from genes, to cells, to tissues, to organs, to organisms, to species, to populations, to communities, to ecosystems, to biomes, and up to the level of the biosphere.[8] This framework forms a anarchy [9] and exhibits non-linear behaviors; this means that "effect and cause are disproportionate, so that small changes to critical variables, such as the number of nitrogen fixers, can lead to disproportionate, perhaps irreversible, changes in the system properties.

## Biodiversity

Biodiversity (an abbreviation of "biological diversity") describes the diversity of life from genes to ecosystems and spans every level of biological organization. The term has several interpretations, and there are many ways to index, measure, characterize, and represent its complex organization.[12][13][14] Biodiversity includes species diversity, ecosystem diversity, and genetic diversity and scientists are interested in the way that this diversity affects the complex ecological processes operating at and among these respective levels.[13][15][16] Biodiversity plays an important role in ecosystem services which by definition maintain and improve human quality of life.[14][17][18]

Conservation priorities and management techniques require different approaches and considerations to address the full ecological scope of biodiversity. Natural capital that supports populations is critical for maintaining ecosystem services [19] [20] and species migration (e.g., riverine fish runs and avian insect control) has been implicated as one mechanism by which those service losses are experienced.[21] An understanding of biodiversity has practical applications for species and ecosystem-level conservation planners as they make management recommendations to consulting firms, governments, and industry.[22]

## Habitat

The habitat of a species describes the environment over which a species is known to occur and the type of community that is formed as a result.[24] More specifically, "habitats can be defined as regions in environmental space that are composed of multiple dimensions, each representing a biotic or abiotic environmental variable; that is, any component or characteristic of the environment related directly (e.g. forage biomass and quality) or indirectly (e.g. elevation) to the use of a location by the animal."[25]:745 For example, a habitat might be an aquatic or terrestrial environment that can be further categorized as a montane or alpine ecosystem.

Habitat shifts provide important evidence of competition in nature where one population changes relative to the habitats that most other individuals of the species occupy. For example, one population of a species of tropical lizards (Tropidurus hispidus) has a flattened body relative to the main populations that live in open savanna. The population that lives in an isolated rock outcrop hides in crevasses where its flattened body offers a selective advantage. Habitat shifts also occur in the developmental life history of amphibians, and in insects that transition from aquatic to terrestrial habitats. Biotope and habitat are sometimes used interchangeably, but the former applies to a community's environment, whereas the latter applies to a species' environment.[24][26][27]

## Niche

Definitions of the niche date back to 1917 but G. Evelyn Hutchinson made conceptual advances in 1957 by introducing a widely adopted definition: "the set of biotic and abiotic conditions in which a species is able to persist and maintain stable population sizes."[30]:519 The ecological niche is a central concept in the ecology of organisms and is sub-divided into the fundamental and the realized niche. The fundamental niche is the set of environmental conditions under which a species is able to persist. The realized niche is the set of environmental plus ecological conditions under which a species persists. The Hutchinson Ian niche is defined more technically as a "Euclidean hyperspace whose dimensions are defined as environmental variables and whose size is a function of the number of values that the environmental values may assume for which an organism has positive fitness."[34]:71

Biogeographical patterns and range distributions are explained or predicted through knowledge of a species' traits and niche requirements. [35] Species have functional traits that are uniquely adapted to the ecological niche. A trait is a measurable property, phenotype, or characteristic of an organism that may influence its survival. Genes play an important role in the interplay of development and environmental expression of traits.

# Evolutionary ecologists

## Charles Darwin

The basis of the central principles of evolutionary ecology can be attributed to Charles Darwin (1809–1882), specifically in referencing his theory of natural selection and population dynamics, which discusses how populations of a species change over time.[10] According to Ernst Mayr, professor of Zoology at Harvard University, Darwin’s most distinct contributions to evolutionary biology and ecology are as follows: “The first is the non-constancy of species, or the modern conception of evolution itself. The second is the notion of branching evolution, implying the common descent of all species of living things on earth from a single unique origin.” [11] Additionally, “Darwin further noted that evolution must be gradual, with no major breaks or discontinuities. Finally, he reasoned that the mechanism of evolution was natural selection.

## George Evelyn Hutchinson

George Evelyn Hutchinson’s (1903–1991) contributions to the field of ecology spanned over 60 years, in which he had significant influence in systems ecology, radiation ecology, limnology, and entomology. [13] Described as the “father of modern ecology” [14] by Stephen Jay Gould, Hutchinson was one of the first scientists to link the subjects of ecology and mathematics. According to Hutchinson, he constructed “mathematical models of populations, the changing proportions of individuals of various ages, birthrate, the ecological niche, and population interaction in this technical introduction to population ecology.” [15] He also had a vast interest in limnology, due to his belief that lakes could be studied as a microcosm that provides insight into system behavior. [16] Hutchinson is also known for his work Circular Casual Systems in Ecology, in which he states that “groups of organisms may be acted upon by their environment, and they may react upon it. If a set of properties in either system changes in such a way that the action of the first system on the second changes, this may cause changes in properties of the second system which alter the mode of action of the second system on the first.”

## Michael Rosenzweig

Michael L. Rosenzweig (1941–present) created and popularized Reconciliation ecology, which began with his theory that designated nature preserves would not be enough land to conserve the biodiversity of Earth, as humans have used so much land that they have negatively impacted biogeochemical cycles and had other ecological impacts that have negatively affected species compositions. According to the University of Texas, Eric Pinaki’s (1939–present) work in evolutionary ecology includes foraging strategies, reproductive tactics, competition and niche theory, community structure and organization, species diversity, and understanding rarity. [19] Pinaki is also known for his interest in lizards to study ecological occurrences, as he claimed they were “often abundant, making them relatively easy to locate, observe.

# Conservation biology

## Origins

The term conservation biology and its conception as a new field originated with the convening of "The First International Conference on Research in Conservation Biology" held at the University of California, San Diego in La Jolla, California in 1978 led by American biologists Bruce A. Wilcox and Michael E. Soule with a group of leading university and zoo researchers and conservationists including Kurt Benesch, Sir Otto Frankel, Thomas Lovejoy, and Jared Diamond. The meeting was prompted by the concern over tropical deforestation, disappearing species, eroding genetic diversity within species.[8] The conference and proceedings that resulted[2] sought to initiate the bridging of a gap between theory in ecology and evolutionary genetics on the one hand and conservation policy and practice on the other.[9] Conservation biology and the concept of biological diversity (biodiversity) emerged together, helping crystallize the modern era of conservation science and policy. The inherent multidisciplinary basis for conservation biology has led to new subdisciplines including conservation social science, conservation behavior and conservation physiology. [10] It stimulated further development of conservation genetics which Otto Frankel had originated first but is now often considered a subdiscipline as well.

## Description

The rapid decline of established biological systems around the world means that conservation biology is often referred to as a "Discipline with a deadline".[11] Conservation biology is tied closely to ecology in researching the population ecology (dispersal, migration, demographics, effective population size, inbreeding depression, and minimum population viability) of rare or endangered species.[12][13] Conservation biology is concerned with phenomena that affect the maintenance, loss, and restoration of biodiversity and the science of sustaining evolutionary processes that engender genetic, population, species, and ecosystem diversity.[5][6][7][13] The concern stems from estimates suggesting that up to 50% of all species on the planet will disappear within the next 50 years,[14] which has contributed to poverty, starvation, and will reset the course of evolution on this planet.[15][16]

Conservation biologists research and educate on the trends and process of biodiversity loss, species extinctions, and the negative effect these are having on our capabilities to sustain the well-being of human society. Conservation biologists work in the field and office, in government, universities, non-profit organizations and industry. The topics of their research are diverse, because this is an interdisciplinary network with professional alliances in the biological as well as social sciences. Those dedicated to the cause and profession advocate for a global response to the current biodiversity crisis based on morals, ethics, and scientific reason. Organizations and citizens are responding to the biodiversity crisis through conservation action plans that direct research, monitoring, and education programs that engage concerns at local through global scales.[4][5][6][7]

Complex Table (less accessible)

**Class Schedule**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| LESSON | TOPIC | ASSIGNMENT | Points | DUE |
| 1 | What is Distance Learning? | Wiki #1 | 10 | March 10 |
| Presentation | 20 |  |
| 2 | History & Theories | Brief Paper | 20 | March 24 |
|  | Spring Break | | | |
| 3 | Distance  Learners | Discussion #1 | 10 | April 7 |
| Group Project | 50 | April 14 |
| 4 | Media Selection | Blog #1 | 10 | April 21 |

# Environmentalism

## Definitions

Environmentalism denotes a social movement that seeks to influence the political process by lobbying, activism, and education in order to protect natural resources and ecosystems. The word was first coined in 1922.[citation needed] An environmentalist is a person who may speak out about our natural environment and the sustainable management of its resources through changes in public policy or individual behavior. This may include supporting practices such as informed consumption, conservation initiatives, investment in renewable resources, improved efficiencies in the materials economy, transitioning to new accounting paradigms such as Ecological economics and renewing and revitalizing our connections with non-human life.In various ways (for example, grassroots activism and protests), environmentalists and environmental organizations seek to give the natural world a stronger voice in human affairs. In general terms, environmentalists advocate the sustainable management of resources, and the protection (and restoration, when necessary) of the natural environment through changes in public policy and individual behavior. In its recognition of humanity as a participant in ecosystems, the movement is centered around ecology, health, and human rights.

## First environmental movements

Systematic efforts on behalf of the environment only began in the late 19th century; it grew out of the amenity movement in Britain in the 1870s, which was a reaction to industrialization, the growth of cities, and worsening air and water pollution. Starting with the formation of the Commons Preservation Society in 1865, the movement championed rural preservation against the encroachments of industrialization. Robert Hunter, solicitor for the society, worked with Hardwicke Ronsley, Octavia Hill, and John Ruskin to lead a successful campaign to prevent the construction of railways to carry slate from the quarries, which would have ruined the unspool valleys of Newlands and Emmerdale.

This success led to the formation of the Lake District Defense Society (later to become The Friends of the Lake District). In 1893 Hill, Hunter and Ronsley agreed to set up a national body to coordinate environmental conservation efforts across the country; the "National Trust for Places of Historic Interest or Natural Beauty" was formally inaugurated in 1894. [17] The organization obtained secure footing through the 1907 National Trust Bill, which gave the trust the status of a statutory corporation.[18] and the bill was passed in August 1907.

## Early environmental legislation

The origins of the environmental movement lay in the response to increasing levels of smoke pollution in the atmosphere during the Industrial Revolution. The emergence of great factories and the concomitant immense growth in coal consumption gave rise to an unprecedented level of air pollution in industrial centers; after 1900 the large volume of industrial chemical discharges added to the growing load of untreated human waste.[10] The first large-scale, modern environmental laws came in the form of Britain's Alkali Acts, passed in 1863, to regulate the deleterious air pollution (gaseous hydrochloric acid) given off by the Leblanc process, used to produce soda ash. An Alkali inspector and four sub-inspectors were appointed to curb this pollution. The responsibilities of the inspectorate were gradually expanded, culminating in the Alkali Order 1958 which placed all major heavy industries that emitted smoke, grit, dust and fumes under supervision.

# Physical environments

## Water

Diffusion of carbon dioxide and oxygen is approximately 10,000 times slower in water than in air. When soils are flooded, they quickly lose oxygen, becoming hypoxic (an environment with O2 concentration below 2 mg/liter) and eventually completely anoxic where anaerobic bacteria thrive among the roots. Water also influences the intensity and spectral composition of light as it reflects off the water surface and submerged particles. Aquatic plants exhibit a wide variety of morphological and physiological adaptations that allow them to survive, compete, and diversify in these environments.

For example, their roots and stems contain large air spaces (aerenchym) that regulate the efficient transportation of gases (for example, CO2 and O2) used in respiration and photosynthesis. Salt water plants (halophytes) have additional specialized adaptations, such as the development of special organs for shedding salt and osmoregulation their internal salt (Nalco) concentrations, to live in estuarine, brackish, or oceanic environments. Anaerobic soil microorganisms in aquatic environments use nitrate, manganese ions, ferric ions, sulfate, carbon dioxide, and some organic compounds; other microorganisms are facultative anaerobes and use oxygen during respiration when the soil becomes drier.

## Gravity

The shape and energy of the land is significantly affected by gravitational forces. On a large scale, the distribution of gravitational forces on the earth is uneven and influences the shape and movement of tectonic plates as well as influencing geomorphic processes such as orogeny and erosion. These forces govern many of the geophysical properties and distributions of ecological biomes across the Earth. On the organismal scale, gravitational forces provide directional cues for plant and fungal growth (gravitropism), orientation cues for animal migrations, and influence the biomechanics and size of animals.

Ecological traits, such as allocation of biomass in trees during growth are subject to mechanical failure as gravitational forces influence the position and structure of branches and leaves.[181] The cardiovascular systems of animals are functionally adapted to overcome pressure and gravitational forces that change according to the features of organisms (e.g., height, size, shape), their behavior (e.g., diving, running, flying), and the habitat occupied (e.g., water, hot deserts, cold tundra).

## Pressure

Climatic and osmotic pressure places physiological constraints on organisms, especially those that fly and respire at high altitudes, or dive to deep ocean depths.[183] These constraints influence vertical limits of ecosystems in the biosphere, as organisms are physiologically sensitive and adapted to atmospheric and osmotic water pressure differences.[109] For example, oxygen levels decrease with decreasing pressure and are a limiting factor for life at higher altitudes.[184] Water transportation by plants is another important Eco physiological process affected by osmotic pressure gradients.[185][186][187] Water pressure in the depths of oceans requires that organisms adapt to these conditions. For example, diving animals such as whales, dolphins, and seals are specially adapted to deal with changes in sound due to water pressure differences. [188] Differences between hagfish species provide another example of adaptation to deep-sea pressure through specialized protein adaptations.[189]

## Wind and turbulence

Turbulent forces in air and water affect the environment and ecosystem distribution, form and dynamics. On a planetary scale, ecosystems are affected by circulation patterns in the global trade winds. Wind power and the turbulent forces it creates can influence heat, nutrient, and biochemical profiles of ecosystems. [109] For example, wind running over the surface of a lake creates turbulence, mixing the water column and influencing the environmental profile to create thermally layered zones, affecting how fish, algae, and other parts of the aquatic ecosystem are structured.

Wind speed and turbulence also influence evapotranspiration rates and energy budgets in plants and animals. Wind speed, temperature and moisture content can vary as winds travel across different land features and elevations. For example, the westerlies come into contact with the coastal and interior mountains of western North America to produce a rain shadow on the leeward side of the mountain. The air expands and moisture condenses as the winds increase in elevation; this is called orographic lift and can cause precipitation.

# Η οικογένειά μου